Mr. Dubois offered the following paper, on behalf of Mr. Eckfeldt and himself:

ON THE

NATURAL DISSEMINATION OF GOLD.

To assert that Gold is at once a very rare and a very abundant metal, would seem to be an abuse of language; and yet, in a certain sense, it would be true in both branches of the proposition. Iron, in its many mineralized forms, has been profusely scattered by the Creative Hand all over the world; and gold is found in so many natural situations and alliances where it would not be looked for, as to hold out the expectation that a diligent search would find it almost as widely, though by no means so plentifully, diffused. Such is not the fact in regard to many other metals, but it is remarkably true of the two which stand, in the market, at the head and foot of the list.

These remarks are preliminary to the detail of several interesting examinations lately made by Mr. Eckfeldt, the principal Assayer of the Mint, from time to time, as opportunities of leisure would allow.

The first experiments were made upon galena, or native sulphide of lead. It was well known that this was occasionally found to contain gold in larger or smaller proportions, according to the various localities. But inasmuch as there is reason to believe that every variety of galena is argentiferous, it seemed an interesting inquiry whether *gold*, as well as silver, is sure to be found in the same association. Our examinations have gone far enough to warrant the belief that such is the case; though this fact could not so well have been ascertained until the manufacture of assay balances had arrived at its present state of perfection. The statement of a few results will be interesting.

The galena ores from the lodes of Kansas, in the famous region of Pike's Peak, concerning which so many extravagant statements have been made, really show but little silver so far. The best, according to our notes, was found to contain seven parts in ten thousand of silver, and one part in eighty thousand of gold; amounting to 27½ dollars of silver, and 7½ dollars of gold to the ton of ore.

Coming nearer home (and omitting further mention of the silver,

as not pertinent to our subject), we find in the galena of Ulster County, New York (Ellenville locality), gold to the amount of 17½ grains, or 75 cents, to the ton.

The most curious result was obtained from the galena of New Britain, in Bucks County, Pennsylvania, where gold was found in the proportion of 2¼ grains, not quite ten cents, to the ton. This represents one part in 6,220,000, and may serve as a remarkable example of refinement in the art of assaying. The operation was performed on five ounces of the ore. The speck of gold which resulted is visible to a good eye, and is exhibited in the Cabinet of the Mint.

Turning next to the examination of lead in its metallic and commercial shape, we find the Spanish bar lead, which is sufficiently free from precious metals to be used as an agent in our Mint assays, contains 12 grains of gold to the ton, or one part in about 1,170,000.

The next inquiry was, whether other metals, especially those which are commonly considered to be naturally unaccompanied with gold, were absolutely so.

Copper was tried in various forms. A cent of 1822, the material for which was imported from England, showed gold equal to one part in 14,500; which is one cent's worth in 20 cents. An English halfpenny showed a like trace of gold. A cent of 1843, of American material, was found to contain one cent's worth of gold in 14 cents. This result brings to mind the old story of the golden cent of 1814. In that year, as was idly reported, the melters at the Mint carelessly emptied some gold into a pot of copper, from which the cents were coined. It gave some trouble at the counter of the Mint for many years afterwards, in consequence of numerous inquiries, and offers to sell. It turns out to be pretty certain that every cent we have coined contains gold, effectually locked in.

Lake Superior copper is perhaps as free from gold as any, yet is not absolutely so. A trial of 30 grammes showed a quantity not sufficient to affect sensibly a delicate assay balance.

Adverting to other metals, it is well known that silver is never found in nature quite free from gold. In the Lake Superior silver there is a mere trace, as also in the silver of the southwestern region of South America. In other localities the proportion is generally greater, though very various.

A specimen of metallic antimony was found to contain gold, one part in 440,000. In bismuth, the gold amounted to one part in 400,000. A specimen of zinc proved to be absolutely free from gold; a result which may relieve some minds of the suspicion that

the very atmosphere of the Mint imparts gold to everything within its walls, or that there was a want of the utmost care in the use of vessels and reagents in these operations.

Perhaps the most curious result of all is that which remains to be stated.

Underneath the paved city of Philadelphia there lies a deposit of clay, whose area, by a probable estimate, would measure over three miles square, enabling us to figure out the convenient sum of ten square miles. The average depth is believed to be not less than fifteen feet. The inquiry was started whether gold was diffused in this earthy bed. From a central locality, which might afford a fair assay for the whole, the cellar of the new market-house in Market Street near Eleventh Street, we dug out some of the clay at a depth of fourteen feet, where it could not have been an artificial deposit. The weight of 130 grammes was dried and duly treated, and yielded one-eighth of a milligramme of gold; a very decided quantity on a fine assay balance.

It was afterwards ascertained that the clay in its natural moisture loses about fifteen per cent. by drying. So that, as it lies in the ground, the clay contains one part gold in 1,224,000.

This experiment was repeated upon clay taken from a brickyard in the suburbs of the city, with nearly the same result.

In order to calculate with some accuracy the value of this body of wealth, we cut out blocks of the clay, and found that on an average, a cubic foot, as it lies in the ground, weighs 120 pounds, as near as may be; making the specific gravity 1·92. The assay gives seven-tenths of a grain, say three cents' worth of gold to the cubic foot. Assuming the data already given, we get 4180 millions of cubic feet of clay under our streets and houses, in which securely lies 126 millions of dollars. And if, as is pretty certain, the corporate limits of the city would afford eight times this bulk of clay, we have more gold than has yet been brought, according to the statistics, from California and Australia.

It is also apparent that every time a cartload of clay is hauled out of a cellar, enough gold goes with it to pay for the carting. And if the bricks which front our houses could have brought to their surface, in the form of gold leaf, the amount of gold which they contain, we should have the glittering show of two square inches on every brick.

We have inquired but little into the researches of other experimenters in this line. Some years ago it was stated that Mr. Len-

nig's workmen had washed out gold from the sands of the river Delaware; and a French writer affirms that there is a trace of gold in the sands of the Rhine.

When we consider the uses to which this noble metal is providentially adapted and wisely applied, we cannot but wonder at the apparent waste or misplacement by which so much is irrecoverably lost; and, to all appearance, had as well not been made. Perhaps such inscrutable mysteries in the realm of nature may help us to submit to other difficulties in other parts of the Divine order and government. Of this we may be confident, that the atoms of gold are homogeneously and equably dispersed through the clay or other matrix; but by what natural process, and for what final cause, these fine particles should be thus diffused, seems quite beyond the reach of human philosophy.

The paper thus offered, however deficient and practically unimportant, may afford a diversion of mind, for the moment, from the one idea of the times upon which we have fallen.

Professor Lesley remarked that the ores of zinc seemed more closely allied, geologically, with alumina than with silica, and were therefore by so much the further removed from gold, the normal alliance of which is supposed to be with silica. As all clays are made up chiefly of alumina and silica, derived from the disintegration of tertiary, secondary, and primary rocks in a long backward series of remanipulations, it should not excite surprise if all clays, without exception, should yield minute quantities of gold. And as all the primary metals have gangues containing silica, which enters as an impurity into the manufactured article, probably in the form of silicon, it is likewise almost inevitable that gold should appear with it.